

**PLASMA IMMERSION ION IMPLANTATION APPARATUS INCLUDING A  
PLASMA SOURCE HAVING LOW DISSOCIATION AND LOW MINIMUM PLASMA  
VOLTAGE**

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**ABSTRACT**

A method for ion planting a species into a surface layer of  
a workpiece in a chamber, the method includes placing the  
workpiece in a processing zone of the chamber bounded by a  
10 chamber side wall and a chamber ceiling facing said  
workpiece and between a pair of ports of the chamber near  
generally opposite sides to the processing zone and  
connected together by a conduit external of the chamber.  
The method further includes introducing into the chamber a  
15 process gas comprising the species to be implanted, and  
further generating from the process gas a plasma current and  
causing the plasma current to oscillate in a circulatory  
reentrant path comprising the conduit and the processing  
zone.

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